JICA Ogata Sadako Research Institute for Peace and Development

JICA Ogata Research Institute Working Paper

The Challenging Issues of Environment/Climate Change Institution and Policy Under the SDGs Regime

From Project to Outcome: the Case of the National Greenhouse Gas Inventory in Indonesia

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No. 225

December 2021

JICA Ogata Sadako Research Institute for Peace and Development

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From Project to Outcome:

the Case of the National Greenhouse Gas Inventory in Indonesia

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Abstract

This study analyzes how and under what conditions technical cooperation may generate larger effects on endogenous and long-term capacity development in developing countries. To this end, we use the case of national greenhouse gas (GHG) inventory in Indonesia, where the task for producing GHG inventories was first outsourced to external experts through a dedicated project, but is now managed by the Ministry of Environment and Forestry (KLHK). While investigating the long-term process through which the country developed its capacity on this issue, we evaluated how and the extent to which the five-year technical cooperation supported by Japan International Cooperation Agency contributed to this by generating catalytic effects. This paper contributes to and complements the existing literature by applying a model of strategic issue diagnosis, by which we traced the evolving issue interpretations at the ministry and their consequent actions. This study finds that the technical cooperation interacted with changes in the institutional environment, raising the issue urgency, feasibility, and interdependence as perceived at KLHK, creating momentum to change their situation, and igniting endogenous capacity development. The study highlights that, as the substantial uncertainty in their reported GHG inventories was identified through the technical cooperation, the issue came to be defined by the ministry as the problem to be solved. This paper identifies the country's specific context as an important factor to explain a project's catalytic effect, or the absence thereof. It emphasizes that contexts must be factored in when evaluating projects, as they are often embedded in longer timeframes and in the wider scope that goes beyond the direct beneficiaries.

Keywords: Capacity development, climate change, issue interpretations, carbon emissions, Indonesia

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This paper is part of the project "The Challenging Issues of Environment/Climate Change Institution and Policy Under the SDGs Regime" by the JICA Ogata Sadako Research Institute for Peace and Development.

This work was supported by the Mitsui & Co. Environment Fund and JSPS KAKENHI Grant Number 18H03449. We would like to thank two anonymous reviewers for valuable suggestions which led to a considerably improved version of the paper. We would also like to express our gratitude to the anonymous interviewees. The opinions expressed in this paper are those of the authors and do not represent the views of the organizations to which they belong.

1. Introduction

A series of the High-Level Fora on Aid Effectiveness under the coordination of the Organisation for Economic Co-operation and Development (OECD) have supported the principle of ownership for capacity development and the catalytic role it may play in development cooperation. As one of the statements adopted in this period, the Accra Agenda for Action declares that “capacity development is the responsibility of developing countries, with donors playing a supportive role, and that technical cooperation is one means among others to develop capacity” (OECD 2008, paragraph 14). The most recent Forum in Busan, Korea has affirmed that “partnerships for development can only succeed if they are led by developing countries” (OECD 2011, paragraph 11). In 2015, the Paris Agreement on Climate Change prominently included this acknowledgement, stating that, “Capacity building should be country-driven, based on and responsive to national needs, and foster country ownership of Parties” (UNFCCC 2015, Article 11.2). However, the policy debate on the role of technical cooperation for capacity development has been limited during the past decade. This paper contributes to much-needed international dialogue and initiatives on this matter.

Keijzer (2013) emphasizes the nature of capacity development as an endogenous and long-term change process, which easily outlives the typical technical cooperation cycle. External actors cannot create capacity: Instead, the role of external partners in capacity development is to serve as a catalyst (Hosono et al. 2011). The term “catalyst” originates from chemistry and has moved into general usage to express “an agent that provokes or speeds significant change or action” (Merriam-Webster 2021). The key notion is that a small agent such as technical assistance can cause larger change (GEF Independent Evaluation Office 2007). However, such larger change has been often ignored. Sato (2013) argued that capacity development “studies have focused too narrowly on donors’ inputs and activities for relatively short periods for specific projects” and "the views and perspectives of insiders (beneficiaries, national service providers, and recipient governments) are not adequately taken into consideration" (2).

With this potential shortcoming of the conventional discussion on capacity development in our mind, we carried out a process evaluation (Moore et al. 2015; Public Health England 2018; Reichert and Gatens 2019) with an aim to explain how the project activities have contributed to outcomes (Rossi et al. 2004). We thereby attempt to identify reasons for successful and unsuccessful outcomes, providing lessons for potential replication (Bess et al. 2004). To this end, we use the case of national greenhouse gas (GHG) inventory in Indonesia, where the task for producing GHG inventories was once outsourced to external experts but is now managed by the Ministry of Environment and Forestry (KLHK). This study will explore how this change has been possible. We utilize the findings of our previous work (Kawanishi et al. 2020a) for tracing the process of the country's capacity development on the issue since the mid-1990s. In the meantime, the present study evaluates how and the extent to which the five-year technical cooperation project supported by Japan International Cooperation Agency (JICA) has generated catalytic effects.

This paper contributes to the application of a model of a strategic issue framework (Dutton and Duncan 1987; Dutton et al. 1990; Dutton and Dukerich 1991) to the evaluation of the capacity development process, which represents how decision makers interpret issues in terms of urgency, feasibility, and interdependence, and how this interpretation may create momentum for organizational change. With this model, the issue interpretations at KLHK will be longitudinally studied. Based on data collected through participant observation, interviews, and document reviews, we explain how an agent such as technical cooperation can generate larger effects on endogenous and long-term capacity development in the recipient country. We find that technical cooperation has interacted with changes in the institutional environment, raising the issue urgency, feasibility, and interdependence as perceived at KLHK, creating momentum to change their situation, and igniting endogenous capacity development. We identify that effective development cooperation is a matter of a long-term commitment, while also dependent on the emergence of the right circumstances that may be beyond the control of external actors.

This paper begins with an introduction of a national GHG inventory and its significance under the Paris Agreement. This will be followed by an overview of the JICA technical cooperation in Indonesia, with a focus on its pilot activities. We then outline the analytical framework to be used in this study. After describing the method, we present the results of the analysis and discuss their implications for project design, delivery, and evaluation.

2. Paris Agreement and national GHG inventory

The Paris Agreement (UNFCCC 2015) was adopted in 2015 at the 21st session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC or the Convention). The agreement enhanced the transparency framework to monitor and evaluate the implementation of the parties' "nationally determined contributions" (NDCs) (Article 13.5), which manifest their actions to reduce GHG emissions and to adapt to the impacts of climate change. Falkner (2016) argued that getting transparency right would be of critical importance to the Paris Agreement's review mechanism, since such a transparent review process would help to generate peer pressure among states. The review process will create regular moments for "naming and shaming" strategies to be deployed against those countries that fall short of international expectations. As mitigation pledges will be determined independently by each country and cannot be enforced through the regime's compliance mechanism, international review and peer pressure will be the main multilateral tools for countries to strengthen the credibility of their pledges. Bodansky (2016) reaches a similar conclusion, asserting that, as countries are not obliged to achieve their respective NDC targets, the transparency framework is "the main mechanism to hold states accountable for doing what they say" (32). COP24, which took place in Katowice, Poland in 2018, adopted the operational details, so-called "modalities, procedures and guidelines"

(UNFCCC 2018), for the transparency framework under the Paris Agreement.

The Paris Agreement's transparency framework builds upon and supersedes the transparency arrangements that have existed under the UNFCCC, which are characterized by Rajamani (2016) as "a bifurcated system that placed differing transparency requirements on developed and developing countries" (502). National communications (NCs) and biennial update reports (BURs) constitute the arrangements that have involved non-Annex I countries (developing countries) under the Convention. NCs provide information on a national GHG inventory, measures to mitigate and facilitate adequate adaptation to climate change, and other relevant information (UNFCCC 1992). The Cancun Agreement (UNFCCC 2010), as adopted at COP16 in Mexico, introduced BURs, which provide an update on the information contained in NCs, including a national GHG inventory (Decision 1/CP.16, paragraph 60(c)). COP17 in Durban, South Africa (UNFCCC 2011) agreed that non-Annex I countries should submit their first BUR by December 2014 (Decision 2/CP.17, paragraph 41(a)) and shall submit BURs every two years thereafter (Decision 2/CP.17, paragraph 41(f)). Financial support has been made available for developing countries to produce their NCs and BURs, provided by the Global Environmental Facility (GEF) as an operational entity of the financial mechanism under the Convention.

The transparency framework under the Paris Agreement applies, albeit with "built-in flexibility" (Article 13.1), to all countries, which are required to regularly submit their national GHG inventories (Article 13.7). The national GHG inventory is an essential element of information reported by the parties, identifying and quantifying a country's anthropogenic sources and sinks of GHGs, thereby forming the foundation for tracking progress toward each country's climate change mitigation goals. According to the guidelines of the Inter-governmental Panel on Climate Change (IPCC) (IPCC 2006, vol. 1, 1.6), the most common methodological approach for a GHG inventory is to combine information on the extent to which human activity takes place, called activity data (AD), with coefficients that quantify the emissions or removals per unit of activity called the emission factor (EF), where emissions = AD*EF. However, it is often difficult for developing countries to properly collect and maintain data. It is also often the case that, instead of creating country-specific emission factors or relevant parameters, developing countries only use so-called "default values" set by the IPCC, which may not reflect their national circumstances. This is one reason why the 2030 Agenda for Sustainable Development called for a "data revolution" (MacFeely 2018).

There is a growing interest among policy and research communities in national GHG inventories. Recent research articles relating to GHG inventories generally consist of two major streams. One type of study addresses the methodological aspects of GHG inventories. By developing country-specific emission factors and/or estimation methods, these studies intend to contribute a more accurate estimation of GHG inventories. The emission sources that have been recently studied include manure at dairy farms in the US (Aguirre-Villegas and Larson 2017), broiler husbandry in Portugal (Pereira 2017), coastal wetlands in the US (Crooks et al. 2018), Canadian managed forests (Kurz et al. 2018), harvested wood products across countries (Sato and Nojiri 2019), and drained organic soils in Germany (Tiemeyer et al. 2020). This type of analysis tends to concentrate on developed countries, which may be due to the availability of data and other resources.

The other stream of research aims to assess a country's capacity for national GHG inventory preparation. Much study in this regard has focused on the challenges faced by developing countries with building the capacity required for more frequent reporting. Damassa and Elsayed (2013) argued that a national GHG inventory process is often managed as a time-delimited project, where funding is given to produce a specific NC and/or BUR. As the project cycle ends, there is a period without funding or activity until the next project cycle begins. As a result, these countries are often unable to retain the necessary technical knowledge, including staff, experts, data, and documentation of methods. Therefore, each attempt must start over with an inventory. Similarly, Breidenich (2011) indicated that a country that hires staff or contracts with experts for GHG inventory preparation by using GEF support may not have the resources to maintain these staff or experts following the completion of the report. Such a country must essentially rebuild capacity for every report – including by seeking external expertise – instead of being able to improve upon the reporting system over time. Kawanishi and his colleagues assessed the institutional capacities for national GHG inventory preparation in developing countries through time-series (Kawanishi et al. 2020a), cross-country (Kawanishi et al. 2020b; 2021), and cross-regime (Kawanishi et al. 2019) analyses. They also examined the determinative factors for the effectiveness of GHG inventory preparation in Japan, and assessed the applicability in developing countries (Kawanishi and Fujikura 2020). Umemiya et al. (2017) analyzed the status and changes in the capacity of developing countries in Asia by applying a matrix of capacity-indicators. Umemiya et al. (2020) also assessed past trends in capacity development support for national GHG inventories through case studies in Vietnam and Cambodia.

The Paris Agreement stipulates that "support shall be … provided for building the transparency-related capacity of developing country parties on a continuous basis" (UNFCCC 2015, Article 13.15). The literature indicates that, while methodological analyses advance in developed countries, capacity development for regularly updating GHG inventories must become stronger in developing countries. It suggests that collaboration between developed and developing countries should be further encouraged (Nita 2019). However, little work has been done to investigate how and under what conditions a particular support has generated effects on long-term capacity development for the national GHG inventory in developing countries. The present study attempts to fill this gap.

3. JICA technical cooperation for the national GHG inventory in Indonesia

3.1 Overview of the technical cooperation

We selected a case of Indonesia and conducted a chronological study to explore how the previously described change was made possible. The country was chosen for the following reasons: (1) a substantial change was made; (2) this change was not a one-time event but realized through long-term development; and (3) the authors' consistent involvement in development cooperation in the country has enabled long-term observations. This study examines JICA's technical cooperation for the following reasons: (1) the project contained the component of supporting Indonesia's capacity development for the national GHG inventory, which was the most significant cooperation of this kind for the country at that time; (2) it constitutes the essential element for long-term capacity development in the country; and (3) it provides lessons for designing transparency-related capacity development support under the Paris Agreement.

At the G20 summit meeting in 2009, then Indonesian President Susilo Bambang Yudhoyono announced the country's voluntary commitment to reduce GHG emissions by 26% by 2020 relative to the business-as-usual (BAU) scenario, and by up to 41% with international assistance (Yudhoyono 2009). This was the first time the country established a quantitative mitigation goal. Following the announcement by Yudhoyono, the national action plan for GHG emission reductions (RAN-GRK) was developed under the facilitation of the National Development Planning Agency (BAPPENAS) and officially announced in 2011 by Presidential Regulation No. 61/2011 (President of Indonesia 2011a). Later that same year, Presidential Regulation No. 71/2011 (President of Indonesia 2011b) was issued to designate the Ministry of Environment (KLH) as the lead agency for national GHG inventory preparation. These two Presidential Regulations were closely related to each other.

In his announcement, Yudhoyono stressed the importance of international cooperation. His commitment represented a huge challenge for Indonesia, where fossil fuels, such as oil, coal, and natural gas, have been the significant sources for meeting the country's energy needs given its economic and population growth. In the meantime, poverty and unemployment remained major problems to be tackled, particularly after the global financial and economic crisis at that time. It has been critical for the Indonesian government to integrate climate change considerations into their national development planning. The quantitative mitigation goal announced by the

President also raised the capacity development needs for the national GHG inventory in order to monitor the progress of mitigation efforts in a reliable and sustainable manner.

Against this backdrop, the "Project of Capacity Development for Climate Change Strategies in Indonesia" was developed as a collaboration between the Indonesian government and JICA from 2010 to 2015 in order to facilitate, among other goals, the implementation of the above-mentioned two Presidential Regulations (JICA 2015a). This project consisted of three sub-projects, one of which was titled the "Sub-Project of Capacity Development for Developing National GHG Inventories," so-called SP3 Project (or simply referred to as "the Project" in this paper). The purpose and outputs of the SP3 Project are shown in Table 1. Its counterpart was originally KLH, which merged with the then Ministry of Forestry to form KLHK in 2015. Beyond the SP3 Project, support for the national GHG inventory was also provided to the ministry by the GEF through the United Nations Development Programme (UNDP), which however was more concerned with producing specific national reports (KLHK 2016b; 2018a).

Based on the interview results, which will be analyzed in more detail later, the present study gives a particular focus on the pilot activities under the Project, which constitute the activities for output 3 in Table 1. They aimed to realize methodological improvements of GHG inventories in the waste sector and develop the associated capacities of those concerned at the national and local levels. They were designed according to the needs of the then KLH, which was assigned a dual role as the overall coordinating agency for national GHG inventory and the agency responsible for estimating GHG inventories in the waste sector under the Presidential Regulation No. 71/2011 (President of Indonesia 2011b). Decision makers at the ministry in those days expressed their expectations that KLH be a role model for other relevant ministries in producing good quality sectoral GHG inventories. The provinces of North Sumatra and South Sumatra were selected as the pilot sites for producing GHG inventories in the waste sector in consideration of several factors, including strong commitments from the local governments.

Prior to this, KLH had been heavily dependent on the IPCC default values for GHG inventory preparation in the waste sector. The Project helped achieving quality improvements by collecting data and developing country-specific parameters. It thereby revealed the scale of their impacts on the reported GHG inventories. At the same time, the pilot activities were intended to meet the capacity development needs of the then KLH and the concerned local governments. The activities were a collaboration between Japanese experts and Indonesian counterparts, essentially offering on-the-job training opportunities. The methodologies were also documented and compiled in a manual so that they would continue to be practiced even after the end of the Project. While the pilot activities covered both solid waste disposal and wastewater treatment sub-sectors, the description in this paper will focus on the former sub-sector, as methane (CH_4) emissions from solid waste disposal sites (SWDS) are the largest source of GHG emissions in the waste sector.

3.2 Tier 1 approach for GHG inventories in the SWDS sub-sector

Prior to the JICA technical cooperation, KLH had applied a Tier 1 approach, the simplest under the IPCC guidelines. Tier 1 is based on the IPCC estimation method with default activity data and parameters. It does not require either country-specific estimation methods or country-specific activity data and parameters (IPCC 2006, vol. 5, 3.7). CH_4 emissions are affected by the amount and composition of the municipal solid waste (MSW) disposed to SWDS (IPCC 2006, vol. 5, 3.8). The IPCC guidelines provide regional default values for per capita generation rate for MSW and the fraction disposed to SWDS. The former has been set at 0.27 ton/capita/year in terms of weight of wet waste, and the latter at 59% (IPCC 2006, vol. 5, 2.5). By using these default values along with the country's population data, KLH had estimated the amount of MSW disposed to SWDS. Waste composition (food waste, paper, textiles, etc.) also affects emissions as different waste types contain different amounts of degradable organic carbon (DOC). While waste compositions vary widely in different regions and countries, the IPCC guidelines establish default data on waste composition in MSW (IPCC 2006, vol. 5, 2.12–13). The composition is usually presented in a wet-weight basis, which needs to be converted into a dry-weight basis before calculating GHG emissions. In this respect, the IPCC guidelines also provide default values for dry matter content in each waste type (IPCC 2006, vol. 5, 2.14). By using these default values, KLH had estimated DOC values contained in each type of waste disposed to SWDS. The estimation under Tier 1, however, inevitably results in uncertainty in reported GHG inventory. The IPCC guidelines indicate that, in order to achieve accurate estimates for CH_4 emissions from SWDS, it is usually necessary to improve data on the amount and composition of solid waste disposal (IPCC 2006, vol. 5, 3.2). The methodological improvements result in a more reliable and accurate understanding of the situation and provide a better basis for discussing what needs to be done in relation to GHG emissions.

3.3 Methodological improvements and their impacts on the reported GHG inventories

The pilot activities included in the JICA technical cooperation were designed in response to the needs of the then KLH for support in applying higher-tier methodologies to estimate emissions. The quantitative mitigation commitment announced by Yudhoyono increased the need for more reliable estimations. To meet this need, Japanese experts and Indonesian counterparts collaborated on sample surveys, described below, at selected locations in the provinces of North Sumatra and South Sumatra intermittently between 2011 and 2014. This sub-section provides a brief description of the methodological approach of the pilot activities. In doing so, it refers to JICA (2015b), Dewi and Siagian (2015), and Ueda and Matsuoka (2016). The summary is provided in Table 2.

The Project dispatched Japanese experts who collaborated with Indonesian counterparts to determine the actual weight measurements for MSW disposed to SWDS where weighbridges were available. As this is not the case for many disposal facilities in the country, sample surveys were conducted. It resulted in the identification of a bulk density ratio as 0.347 ton/m^3, which was used to convert truck volume data, as recorded at the gate of SWDS, to waste weight data. Although limited to waste from households, waste stream surveys were also carried out in several locations to identify the pathways of MSW from sources to different types of treatment. The results indicated that the waste pathways were noticeably different from the IPCC default values, as shown in Table 3. As each type of treatment has its own characteristics regarding GHG emissions, the difference in the pathways affected GHG inventories. Furthermore, the survey identified the MSW generation rate as 0.22 ton/capita/year on average, which was lower than the IPCC default value (0.27 ton/capita/year). In addition, the Project identified specific parameters for waste composition and dry matter content, which differed considerably from the IPCC default values, as presented in Table 4. Use of these specific parameters has enabled the provision of a more accurate estimation of the DOC content in each waste type.

The combined impacts of the above-mentioned methodological improvements on the reported GHG inventories turned out to be substantial. As depicted in Fig. 1, CH_4 emissions from SWDS decreased by 37.0% in North Sumatra and by 28.9% in South Sumatra. These reductions were not due to climate change mitigation actions but due to purely methodological improvements in GHG inventory estimations. These findings were shared and discussed with decision makers at KLH (and KLHK).

4. Framework and method

4.1 Analytical framework: Capacity development and a model of strategic issue diagnosis

The present study aims to explain how an agent such as technical cooperation generates larger effects on endogenous and long-term capacity development in the recipient country. We will trace the process through which technical cooperation interacted with changes in the institutional environment, raised the issue interpretations as perceived at KLHK, created momentum to change their situation, and ignited endogenous capacity development. This sub-section outlines the analytical framework to be used in this paper.

Capacity development is defined by OECD (2006) as "the process by which people, organizations and society as a whole initiate, strengthen, create, adapt and maintain capacity over time" (OECD 2006, 113). Similarly, it is defined by the UNDP as "the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time" (UNDP 2009, 5). Three levels are identified "where capacity is grown and nurtured: in an enabling environment, in organizations and within individuals. These three levels influence each other in a fluid way—the strength of each depends on, and determines, the strength of the others," where the enabling environment, or the institutional environment, is defined as "the broad social system within which people and organizations function" (UNDP 2009, 11).

Dutton and Dukerich (1991) asserted that "organizations respond to their institutional environments by interpreting and acting on issues," where issues are defined as "events, developments, and trends that an organization's members collectively recognize as having some consequence to the organization" (518). Dutton et al. (1990) also argued that issues could be interpreted as a threat by some organizations and an opportunity by others, depending on their situation. Dutton and Duncan (1987) indicated that organizations respond differently to changes in the institutional environment in large part because issues are interpreted differently by decision makers within those organizations. They proposed a model of strategic issue diagnosis, which represents how decision makers interpret issues and how the interpretation does or does not create momentum for change.

According to Dutton and her colleagues (Dutton and Duncan 1987; Dutton et al. 1990; Dutton and Dukerich 1991), the interpretation of issues by decision makers is captured in their assessments of the issue's *urgency*, *feasibility*, and *interdependence*. Issue urgency describes the value derived from investing in an issue. The greater the urgency of an issue, the greater the perceived need to change the current state of affairs in the organization. Issue urgency is perceived to be higher when an issue is assessed as *important*, *immediate*, or *of greater duration*, and when decision makers believe their organization is *responsible* for the issue. Issue importance is defined as a perceived loss if no action is taken with respect to an issue. More urgency is also perceived in association with immediate issues. Similarly, issues that are perceived to be longstanding are often deemed more urgent. When decision makers perceive their organization to be responsible for the issue, they are more likely to feel accountable for its resolution.

Interpreting an issue also depends on judgements regarding the feasibility of taking action. Issue feasibility refers to the probability of successful issue resolution. When an issue is assessed as feasible to resolve, decision makers are more willing to invest in it. Assessments of issue feasibility are formed from perceptions about whether organizations can identify the means for resolving the issue and whether these means would be available and accessible.

Furthermore, an issue is not perceived in isolation from other issues. Instead, issues are often interrelated. To the extent that decision makers perceive that investment in one issue spills over into other issues, the perceived issue interdependence increases. One example is that climate mitigation efforts may have unintended effects on other government priorities, such as the composition of the job market or economic growth.

Dutton and her colleagues paid close attention to the role of decision makers in interpreting issues. Daft and Weick (1984), however, indicated that "the organizational interpretation process is something more than what counts by individuals…Individuals come and go, but organizations preserve knowledge, behaviors, mental maps, norms, and values over time" (285). In this relationship, they stressed a role of sharing, which enables decision makers and other organizational participants to converge on an approximate interpretation. They argued that "reaching convergence among members characterizes the act of organizing and enables the organization to interpret as a system" (285).

Thus, the model suggests that individuals, an organization, and the institutional environment – the three levels where capacity grows – interact each other to affect issue interpretations. Based on the issue assessments, a momentum for change is created, which refers to "the level of effort and commitment that decision makers are willing to devote to action designed to resolve an issue" (Dutton and Duncan 1987, 286). An issue that is assessed as urgent, feasible, and interdependent is allocated greater levels of resources in the form of time dedicated to the issue, money made available to address the issue, and higher prioritization in an agenda (Dutton et al. 1990). Thus, the momentum for changing the situation "through which forces for further adaptation are set into force" endogenously ignites development of the capacities to address the issue (Dutton and Duncan 1987, 280). Based on this understanding, we utilize the status of issue interpretations as the proxy indicator to express the extent to which endogenous capacity development is induced.

Dutton and Duncan (1987) put forward the 2x2 matrix, as illustrated in Fig. 2. The cells represent the combinations of urgency-feasibility assessments and organizational responses. Cell I represents a case when an issue is judged as not urgent and its resolution is perceived as infeasible, and therefore the impetus to act is absent. Cell II indicates a situation where an issue is judged as feasible to resolve, but it is not viewed as urgent. In this case, responses are more likely to be incremental. Cell III is a case when an issue is viewed as urgent, but infeasible to solve. The continuation of this situation would lead to a crisis, calling the legitimacy of organizational management into question. Cell IV represents a case where the momentum for change is created.

4.2 Data collection and coding

We employed participant observation, interviews, and document reviews, as summarized in Table 5. One of the co-authors had the opportunity to be stationed as a member of the staff for the national GHG inventory at KLHK and its predecessor, KLH, from May 2013 to February 2017. Other authors have also observed the evolution of the ministry through their long-term involvement in development cooperation. These observations were augmented by interviews that took place in Jakarta in June and August 2019. We interviewed staff in charge at KLHK, external experts with a close relationship with KLHK, and staff of a donor agency with knowledge on this topic. We sent the following questions to the interviewees in advance to enable them to have enough time to recall relevant past events and organizational responses: (1) How is the national GHG inventory currently produced in Indonesia? What are the roles of KLHK, other line ministries, and external experts? How are their roles related to each other? (2) What was the case before this present situation? (3) How has the capacity of KLHK been developed? How have the necessary knowledge and skills been nurtured and retained? (4) What are the major events that have affected capacity development, and how did they affect the process? (5) What kinds of development cooperation have been involved? What are their impacts on capacity development? (6) What is the expected status of national GHG inventory preparation in the future? What are the key challenges that remain?

One author facilitated semi-structured interviews based on the above questions, and the other authors raised additional questions where necessary. We recorded the interviews by note-taking and converted the notes into a typed format soon after each interview took place. Interview data were then categorized into key events in the institutional environment, other developments, major interpretations of the national GHG inventory issue, and major actions on the issue. In our study, the JICA technical cooperation was identified as "other developments." "Key events" are restricted to those taking place externally to KLHK (or KLH), while "actions" are those initiated by the ministry. Consequently, the issuances of presidential regulations were defined as "key events," while the issuances of ministerial regulations of KLHK (or KLH) were categorized as "actions." We conducted the above categorization of the interview data manually by placing handwritten annotations on the transcripts (Miles and Huberman 1994; Dunn 2010). We thus traced a chronological change of the assessments of the issue urgency and feasibility on the 2x2 matrix in Fig. 2.

We also closely examined national documents, such as the country's presidential and ministerial regulations, as well as its submissions to the UNFCCC. These document reviews were conducted and described by one author and then confirmed by the other authors.

5. Results

The data generated through participant observation, interviews, and desk-top reviews indicated a consistent pattern, which has been mapped onto the three phases of issue interpretation, as presented in Table 6. We identify these three phases in chronological order as “parking,” “run-up,” and “take-off.” The parking phase started with the entry-into-force of the UNFCCC in March 1994, which obliged all parties to submit national GHG inventories. While several factors were involved, the following two events in the institutional environment were found to be crucial for changes in the interpretation of the issue and were therefore considered the starting points of the run-up and take-off phases, respectively. First, the country’s quantitative commitment to reduce GHG emission, as announced by then President in September 2009, raised the significance of the national GHG inventory as a foundation for tracking progress toward the target. Second, the merger of two ministries in 2014 to form KLHK, which has greater authority relating to climate change, had a substantial effect on their perceived issue responsibility. The JICA technical cooperation, which was implemented primarily during the run-up phase, interacted with these institutional changes and had significant effects on their issue assessments, creating a momentum for change and igniting capacity development, as illustrated in Fig. 3. Each phase is distinctive in terms of issue interpretation at KLHK and its predecessor KLH. Although Table 6 presents these three phases as though they were clearly separated from one another, they in fact shade into each other (Dutton and Dukerich 1991). Each of these phases is presented below in terms of key events, other developments (where applicable), major interpretations of the national GHG inventory issue, and organizational actions on the issue.

5.1 Parking phase (March 1994–September 2009)

Key Events. The UNFCCC was adopted in 1992 and entered into force in 1994, obliging all parties to submit NCs, of which the national GHG inventory is one of the main components. Developing countries were required to submit their first NC within three years of the entry-into-force of the Convention, or of the availability of financial resources (UNFCCC 1992). In the beginning, KLH was assigned as Indonesia's national focal point of the UNFCCC. However, this function was transferred to the National Council for Climate Change (DNPI) in 2008, when it was established by Presidential Regulation No. 46/2008 (President of Indonesia 2008).

Major Interpretations. The national GHG inventory issue was still new for the country, and only a limited number of national experts could perform GHG inventory calculations. It was also considered to be an isolated issue. As Indonesia did not yet have a quantitative target for GHG emission reductions, the value of GHG inventories in relation to climate change mitigation planning and evaluation was not widely acknowledged.

Major Actions. KLH took the lead in developing the National Action Plan Addressing Climate Change (KLH 2007), which was released just before COP13 in Bali, Indonesia. However, it scarcely addressed the issue of the national GHG inventory.

National Reporting to the UNFCCC. Indonesia submitted its first NC in 1999, a little earlier than its neighboring countries of Malaysia, the Philippines, and Thailand, which reported their first NCs in 2000 (UNFCCC 2019). The national GHG inventory was produced by external experts with external funding support (KLH 1999). The national reporting was infrequent; the issue was not yet perceived as urgent, feasible, or interdependent.

5.2 Run-up phase (September 2009–October 2014)

Key Events. The crucial turning point came at the G20 summit meeting in 2009, when then Indonesian President Susilo Bambang Yudhoyono announced the country's voluntary commitment to reduce GHG emissions by 26% by 2020 relative to the BAU scenario, and by up to 41% with international assistance (Yudhoyono 2009). This was the first time the country established a quantitative mitigation goal, raising the significance of a national GHG inventory. As mentioned previously, following the announcement by Yudhoyono, the Presidential Regulations No. 61/2011 on RAN-GRK (President of Indonesia 2011a) and No. 71/2011 on the national GHG inventory (President of Indonesia 2011b) were issued. According to Wibowo and Giessen (2015), three government agencies were most influential in the implementation of climate change policies in Indonesia at this stage: DNPI as the national focal point of the UNFCCC, BAPPENAS as the coordinator for RAN-GRK, and the REDD+ Agency as the coordinator of activities to reduce GHG emissions from deforestation and forest degradation in Indonesia (President of Indonesia 2013).

In the meantime, the reporting requirements under the UNFCCC became increasingly stringent through COP decisions in Cancun and Durban, as described earlier (UNFCCC 2010; 2011).

Other Developments. The JICA technical cooperation was implemented from 2010 to 2015, covering most of the period of the run-up phase. The interviewees under the present study almost unanimously agreed that the Project component with the most significant effects on the subsequent capacity development at KLH (and KLHK) was its pilot activities. The activities demonstrated that CH_4 emissions from SWDS decreased by around 30% or even more in the pilot provinces due to purely methodological improvements in GHG inventories, as shown in Fig. 1. According to Dewi and Siagian (2015) and Ueda and Matsuoka (2016), the findings had the following two implications. First is a matter of credibility of the national GHG inventory as a basis for establishing the country's climate change mitigation target. As a GHG inventory is an essential instrument for projecting the BAU scenario, its uncertainty, if substantial, would likely raise doubt about the adequacy of the mitigation target. Second is a matter of whether emission reductions resulting from mitigation actions can be adequately reflected in the reported GHG inventories. As described earlier, the country's previous approach to estimating CH_4 emissions from SWDS was based on the use of population data in combination with the relevant IPCC default values. Even though waste reduction, reuse, and recycling (3R), for example, are among the mitigation actions as planned under the country's RAN-GRK and NDC, emission reductions resulting from such actions would not be well captured by the reported GHG inventories if the estimations continued to be based on population. The issue of developing GHG inventories came to be defined by KLH as the problem that must be solved (Kingdon 2004).

The Project has also provided KLH with the means for addressing the issue. For example, methodologies for improving GHG inventories in the waste sector have been demonstrated and compiled in a manual. Country-specific parameters, such as those for waste composition and dry matter content, have been developed. Reporting software has also been designed and implemented.

Major Interpretations. The announcement by Yudhoyono had a significant effect on interpretations of the national GHG inventory issue at KLH. The national GHG inventory was no longer an isolated issue and its interdependencies were highlighted after the Presidential announcement. Perceived issue responsibility was also higher at KLH, as it was designated as the overall lead agency for national GHG inventory preparation under Presidential Regulation No. 71/2011. The JICA technical cooperation interacted with these institutional changes and enhanced their perceived issue urgency and feasibility.

However, there were some limitations. KLH had to coordinate with DNPI in submitting GHG inventories to the UNFCCC. It was also necessary for KLH to coordinate with BAPPENAS to promote a link between RAN-GRK and the national GHG inventory. In addition, as it still took time for KLH to produce GHG inventories on its own, the ministry continued to rely on external experts for GHG inventory calculations during this phase.

Major Actions. KLH contributed to formulating the Indonesian Climate Change Sectoral Roadmap (BAPPENAS 2009), which clearly stated the importance and necessity of strengthening the capacity for regularly updating GHG inventories. KLH established the Center for National GHG Inventory System in 2012, called the SIGN Center, to facilitate GHG inventory preparation. KLH took advantage of the technical cooperation for strengthening staff training (AFD and JICA 2014; JICA 2015a; 2015b).

National Reporting to the UNFCCC. After an interval of more than ten years from the submission of the first NC, the second NC was submitted in 2011, for which a national GHG inventory was produced by external experts under the overall coordination of KLH (KLH 2011).

5.3 Take-off phase (October 2014–July 2021)

Key Events. Another turning point came when President Joko Widodo took office in October 2014. Under Presidential Regulation No. 165/2014 (President of Indonesia 2014), he announced that a merger of two ministries, KLH and the Ministry of Forestry, would form KLHK. With the issuance of Presidential Regulation No. 16/2015 (President of Indonesia 2015) in January 2015, the Directorate General of Climate Change was established at KLHK. This Regulation also dissolved the DNPI and the REDD+ Agency, transferring their functions to KLHK and placing them under this Directorate General. The restructuring was aimed at eliminating overlapping jurisdictions and consolidating authority related to climate change. The adoption of the Paris Agreement in 2015 was also a significant milestone. It obliged all parties to regularly provide GHG inventories to track progress on the implementation of their respective NDCs. KLHK has been authorized to provide overall coordination for both NDCs and the national GHG inventory.

Other Developments. The JICA technical cooperation was completed in October 2015. The Project assets continued to be utilized by KLHK, and the results of the pilot activities were shared and discussed with decision makers.

Major Interpretations. With the consolidation of the climate change-related authority, perceived issue responsibility and interdependence significantly increased at KLHK. Now that it is the national focal point of the UNFCCC, KLHK is responsible for biennially updating transparency reports under the Paris Agreement. This requires a sustainable national GHG inventory system. The interviews have revealed that decision makers at KLHK find it unsustainable to continue to rely on a limited number of external experts for GHG inventory preparation. Instead, they have a keen interest in building internal capacity for regularly updating GHG inventories. They also recognize that capacity development for GHG inventory preparation has a positive spill-over effect on another important issue, namely the formulation of NDCs and monitoring and evaluation of their implementation, which is also under the direct responsibility of KLHK. In the meantime, the perceived issue urgency and feasibility have been raised through the technical cooperation (JICA 2015a; 2015b).

Major Actions. In April 2015, the Ministerial Regulation No. P.18/MENLHK-II/2015 on the organization and function of KLHK was issued (KLHK 2015). Along with four other directorates, the Directorate of GHG inventory and MRV was established under the Directorate General of Climate Change. As illustrated in Fig. 4, KLHK has thus scaled up the national GHG inventory issue, creating greater visibility of the issue (Young 2002; Gupta 2008). The number of technical staff regularly assigned at this directorate is more than 12, compared with six for the SIGN Center at KLH. In addition to strengthening staff training, KLHK has established key performance indicators for staff appraisals. Regularly updating GHG inventories is among those indicators applied to the staff in charge.

During its period of implementation from 2010 to 2015, the JICA technical cooperation interacted with the changes in the institutional environment and created a momentum to change the situation. This resulted in some actions that were subsequently taken by KLHK during the take-off phase, as shown in Table 7. For example, the ministry replicated methodological improvements under the pilot activities to other provinces, such as DKI Jakarta, East Java, and Riau. It revised waste stream data through further reviews of related studies and applied the refined values in the subsequent rounds of GHG inventory preparation. It also upgraded the reporting software to the Web-based system, so-called SIGN-SMART, which enabled all the other relevant line ministries and local governments to submit data and information online to KLHK. These actions have, in turn, stimulated further capacity development.

In December 2017, the Ministerial Regulation No. P.73/MENLHK/SETJEN/KUM.1/12/2017 on national GHG inventory implementation and reporting guidelines was issued (KLHK 2017). While KLHK currently produces the national

GHG inventory using activity data provided by other relevant ministries, the above-mentioned Ministerial Regulation envisions that the relevant ministries would produce their respective sector inventories themselves, which would then be validated and compiled by KLHK (KLHK 2018a; 2018b).

National Reporting to the UNFCCC. Following the enhanced assessments of the issue urgency, feasibility, and interdependence, national reporting became more frequent. Under the overall coordination of KLHK, the Indonesian government formulated and submitted its first NDC (KLHK 2016a) in 2016. The first BUR (KLHK 2016b) and third NC (KLHK 2018a) were submitted in 2016 and 2018, respectively, for which GHG inventories were produced by KLHK with considerable support by external experts. The second BUR (KLHK 2018b) was submitted by the end of 2018, for which internal staff of KLHK produced a national GHG inventory on their own for the first time. External experts provided technical advice only. It should be noted that this change has not interrupted the improvement trend in the quality of the GHG inventory. While the internal staff of KLHK produced a national GHG inventory on their own for the first time with the second BUR, the technical analysis by international experts under the UNFCCC has commended the country for moving to a higher tier for estimating some parts of the inventory's GHG emissions and removals (UNFCCC 2020).

Most recently in July 2021, Indonesia updated the first NDC, reaffirming its commitment to unconditionally reduce 29% of GHG emissions against the BAU scenario by 2030 (KLHK 2021a). The country also announced its long-term low GHG emission development strategy, stating that "Indonesia will increase ambition on GHG reduction by achieving the peaking of national GHG emissions in 2030 … with further exploring opportunity to rapidly progress towards net-zero emission in 2060 or sooner" (KLHK 2021b, p iii). The national GHG inventory for the base year was utilized as a foundation for the formulation of these strategies.

6. Discussion

The findings of the present study have implications for project design and evaluation. It is relatively easy to identify and assess the achievement of project outputs. However, the outcomes can only materialize in the long-run, and it is often difficult to specify how they relate to a particular intervention. The present study evaluated how the five-year technical cooperation has generated effects in the context of the endogenous and longer-term capacity development for the national GHG inventory in Indonesia. It applied the model of strategic issue diagnosis, which enabled the tracing of evolving issue interpretations at KLHK and their actions. It thereby revealed how an agent such as technical cooperation has caused larger and faster changes. This paper thus provided one possible approach to overcoming the potential shortcomings in the conventional project evaluation, which Sato (2013) argued was often too narrowly (output-) focused and too short-sighted in terms of the period of analysis.

This study has found that the changes in Indonesia's institutional environment, such as the country's quantitative commitment for emission reductions, the concentration of the authorities relating to climate change, and the adoption of the Paris Agreement, heightened the urgency and interdependence as perceived at KLHK on the national GHG inventory issue. In the meantime, the substantial uncertainty in the reported GHG inventories, as demonstrated by the pilot activities under the Project, has reinforced their perceived issue urgency and interdependence. The issue thus came to be defined by KLHK as the problem to be solved. The Project also provided the ministry with the means for addressing the issue, thereby raising their perceived issue feasibility. These interpretations interacted with each other to create momentum for KLHK to take their own actions for changing the situation, which has in turn endogenously stimulated their further capacity development, as illustrated in Fig. 3.

Without the above-mentioned changes in the institutional environment, the Project would not have generated such effects. Without the Project, on the other hand, the country's capacity development would not have been so large and fast. Using the 2x2 matrix as proposed by Dutton and Duncan (1987), Fig. 5 shows, for illustrative purposes, the changing positions of KLHK concerning the interpretations of the national GHG inventory issue. The issue was originally perceived by the ministry as neither urgent nor feasible to resolve, and therefore impetus to act was absent. Over time, however, it has moved closer to Cell IV, representing a case where an issue is viewed as urgent and its resolution is perceived as more feasible than before, generating momentum for change. Fig. 5 also illustrates the catalytic effects of the technical cooperation, suggesting that the move from Cell I to IV has been larger and faster than what would have been the case without the Project. Conceptually speaking, the longer-term outcome of the technical cooperation may be given by the distance between the points A and B in Fig. 5. This distance represents the catalytic effect of the technical cooperation, even though its measurement is beyond the scope of the present study.

It should also be noted that the Project contained not only the components with positive impacts but also those with marginal effects. While the Project provided technical training for other relevant ministries, these effects have been limited. As mentioned earlier, although the Ministerial Regulation No. P.73/MENLHK/SETJEN/KUM.1/12/2017 (KLHK 2017) envisions that the line ministries would produce their respective sectoral inventories themselves (KLHK 2018a; 2018b), they currently only provide data, using which KLHK produces GHG inventories. Fig. 6 shows, for illustrative purposes, the relative positions of KLHK and other line ministries concerning their interpretations of the national GHG inventory issue, indicating that other ministries may not be on a par with KLHK in terms of their perceived issue urgency and feasibility. The technical training might have helped raise their perceived issue feasibility. However, without addressing their issue urgency (and interdependence), it would not generate effects towards realizing what the above Ministerial Regulation envisions. The technical transfer would have been more effective if it would have been accompanied by additional measures, such as the clarification of roles, the allocation of sectoral emission reduction targets, and the assignment of performance indicators to the respective line ministries.

7. Conclusion

Using the case of the national GHG inventory in Indonesia, this study evaluated how an agent such as technical cooperation generated larger effects on endogenous capacity development. It identifies Indonesia's specific context as an important factor to explain the project's catalytic role. Countries' respective contexts must be well understood and factored in when evaluating projects, as they are often embedded in longer timeframes and encompass a wider scope that goes beyond the direct beneficiaries. In this respect, we utilized the model of strategic issue diagnosis to trace the evolving issue interpretations and the actions that resulted. The methodology employed under this study may also be applied to evaluating the catalytic effects of technical cooperation, or the absence thereof, on long-term capacity development in other fields and sectors.

According to the latest report of Indonesia (KLHK 2018b), the country's GHG emissions for three main gases have increased by more than 40% from 2000 to 2016. Despite year-to-year variations, the upward trend in GHG emissions is visible, suggesting that capacity development relating to national GHG inventory preparation in itself does not have direct impacts on emissions reductions. However, as highlighted in this paper, a national GHG inventory is a foundation for each country's mitigation policy planning and evaluation. This value is critical under the Paris Agreement.

Further research is suggested concerning the validity of the analytical framework, which may be tested through comparison with other countries. Additional studies may be carried out to understand whether the interpretations of the national GHG inventory issue are different across countries. If they are, studies would examine why, and determine whether and how these differences may have resulted in differing quality and/or frequency of national reporting.

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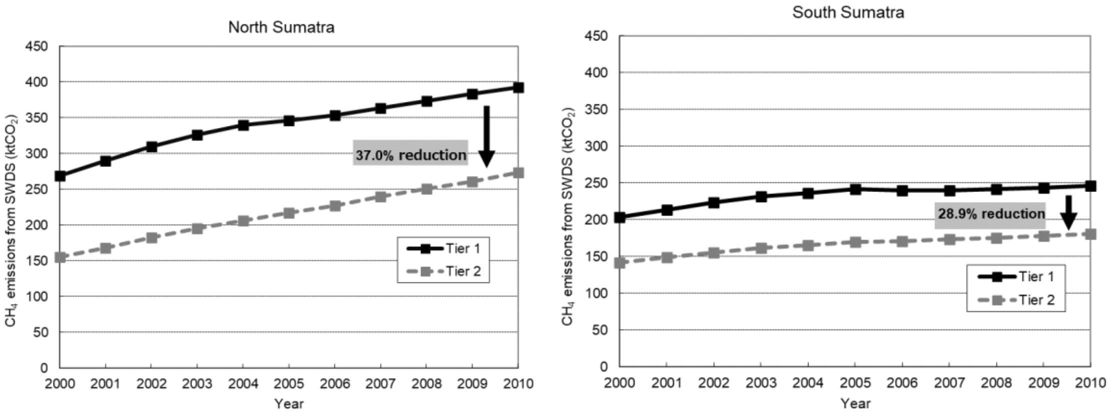

Fig.1: Impacts of the methodological improvements on the reported GHG inventories for methane (CH$_4$. emissions from solid waste disposal sites (SWDS. in the provinces of North Sumatra and South Sumatra (adopted from Ueda and Matsuoka 2016)

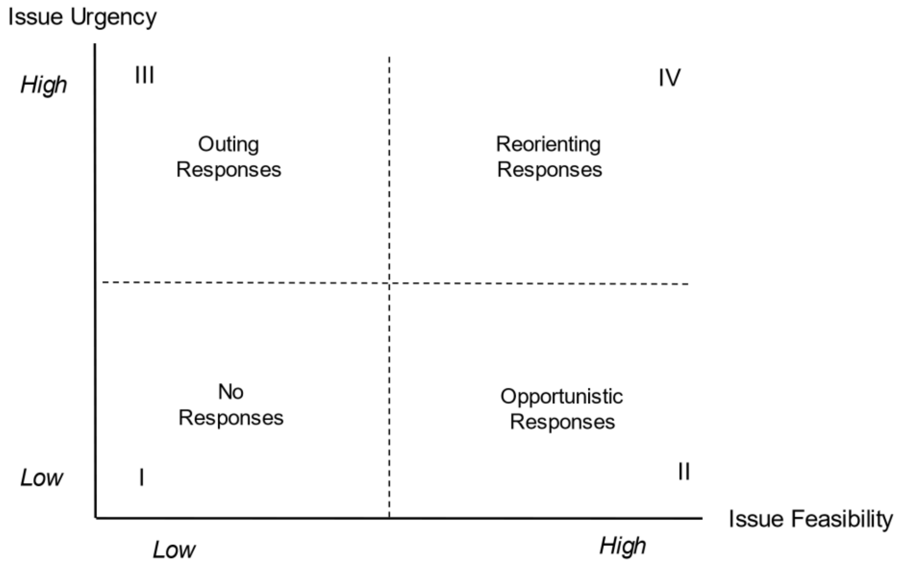

Fig.2: Interaction of urgency and feasibility assessments and the relationship to organizational responses (adopted with modification from Dutton and Duncan 1987)

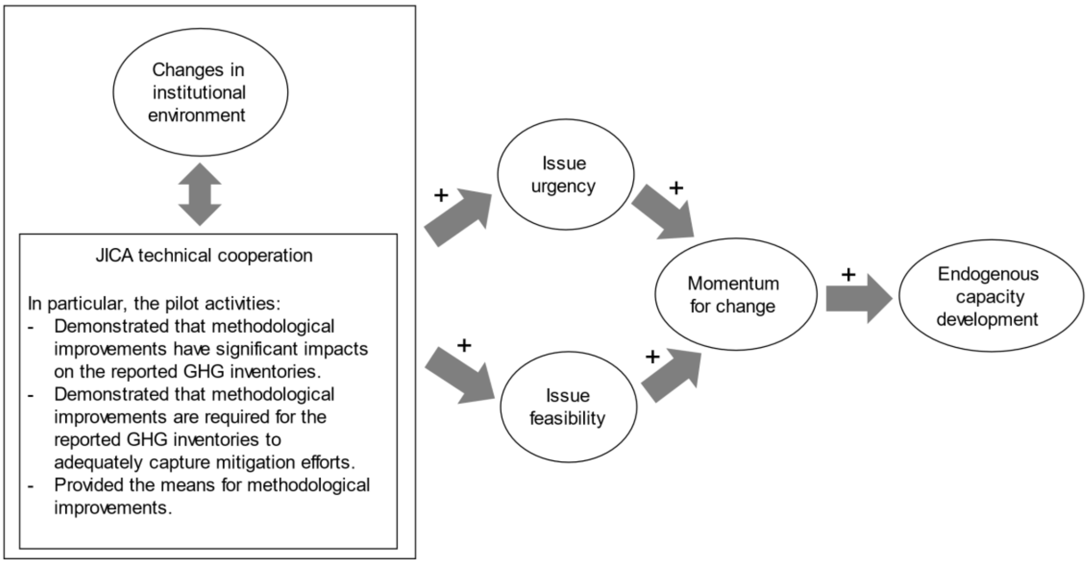

Fig.3: Diagram of catalytic effects of technical cooperation on endogenous capacity development (produced in reference to Dutton and Duncan 1987)

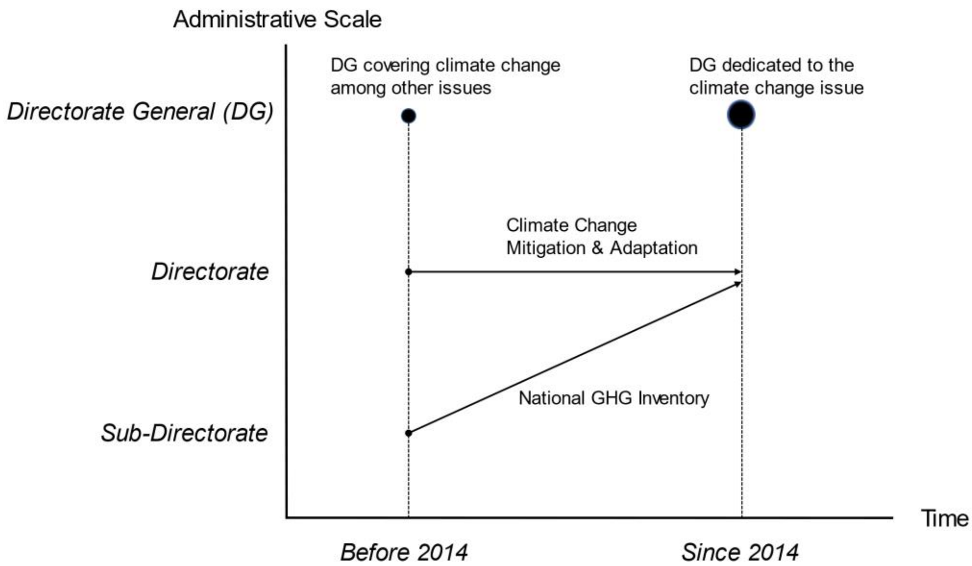

Fig.4: Upscaling of the national GHG inventory issue on the administrative scale at KLHK (formerly KLH. (produced in reference to Gupta 2008)

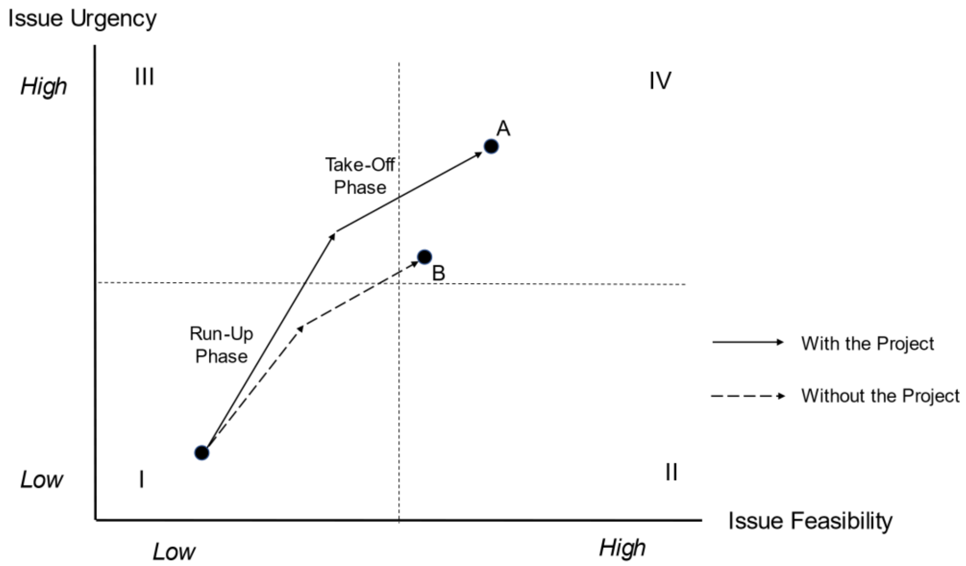

Fig.5: Changing positions of KLHK (formerly KLH. concerning the interpretations of the national GHG inventory issue (produced in reference to Dutton and Duncan 1987)

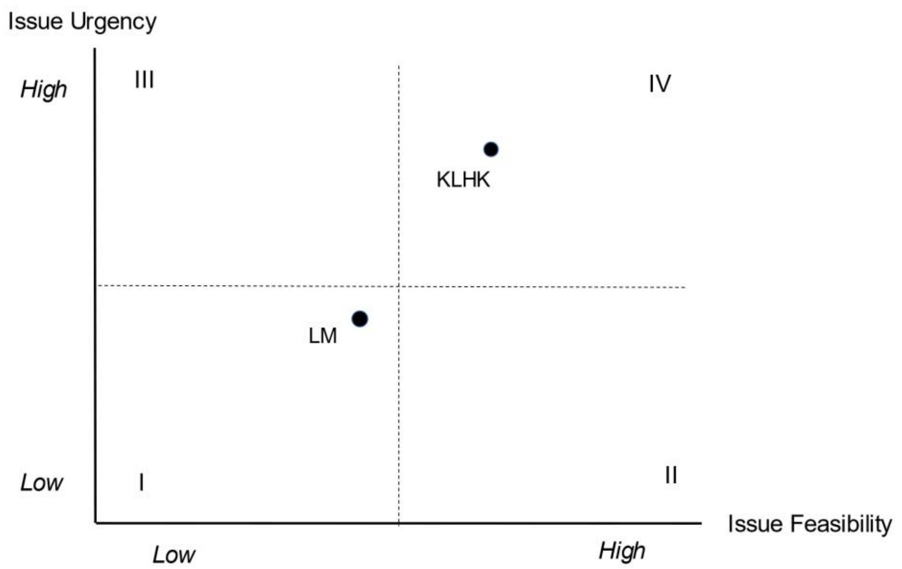

Fig.6: Relative positions of KLHK and other relevant line ministries (LM. concerning the interpretations of the national GHG inventory issue (produced in reference to Dutton and Duncan 1987)

Table 1: Sub-Project of Capacity Development for Developing National GHG Inventories (JICA 2015b)

Project purpose	National GHG inventories are compiled by KLHK on a regular basis in cooperation with key ministries and local governments.
Output 1	National System for preparing national GHG inventories is designed.
Output 2	Capacity to periodically and systematically manage data necessary for national GHG inventories is enhanced.
Output 3	Understanding of accuracy, transparency, and reliability of GHG inventories is enhanced for each sector (energy; industrial processes; agriculture; land use, land-use change and forestry; and waste. among key ministries and local governments.

Table 2: Methodological approach for estimating CH_4 emissions from municipal solid waste (MSW. disposed to waste disposal sites (SWDS. under the Project (JICA 2015b; Dewi and Siagian 2015; Ueda and Matsuoka 2016)

	Before the Project	During the Project
Amount of MSW disposed to SWDS	Used the country's population data in combination with the IPCC default values for MSW generation rate and the fraction of MSW disposed to SWDS.	Conducted actual weight measurements for MSW disposed to SWDS where weighbridges were available. Otherwise, the estimations were based on truck volume data recorded at the gate of SWDS, multiplied by a bulk density ratio, which was developed through the pilot activities. Waste stream survey was also carried out, although it was limited to waste from households.
Waste composition/ Dry matter content	Used the IPCC default values.	Conducted sample surveys to identify specific parameters, which served for more accurate estimation of the degradable organic carbon (DOC. values in each waste type.

Table 3: IPCC default values and the survey results, as well as the values subsequently applied in the first biennial update report (BUR), concerning the fractions of municipal solid waste (MSW. disposed to solid waste disposal sites (SWDS. and other treatments (IPCC 2006, vol. 5, 2.5; Dewi and Siagian 2015; KLHK 2016b, p 2-74)

	IPCC default values	Survey results			Values as applied to the first BUR after refinements
		North Sumatra	South Sumatra		
			Area 1	Area 2	
Disposed to SWDS	0.59	0.64	0.36	0.44	0.60
Compost	0.05	-	-	0.06	0.02
Open burning	-	0.28	0.18	0.15	0.35
Incineration	0.09	-	-	-	-
Buried at backyard	-	0.05	0.43	0.12	-
Reduce, reuse, recycle	-	0.01	0.02	0.06	0.02
Others	0.27	0.03	0.02	0.16	0.01

Table 4: IPCC default values and the survey results concerning municipal solid waste (MSW. composition and the shares of dry matter content in wet weight (IPCC 2006, vol. 5, 2.12; 2.14; Dewi and Siagian 2015; KLHK 2016b, p 2-76)

	MSW composition (C. / dry matter content in wet weight (D. (%)					
	IPCC default values		Survey results			
			North Sumatra		South Sumatra	
	(C)	(D)	(C)	(D)	(C)	(D)
Paper/ Cardboard	12.9	90	9.4	44.2	10.5	52.3
Textiles	2.7	80	3.2	73.1	1.8	55.5
Food waste	43.5	40	50.0	59.2	58.8	32.5
Wood	9.9	85	-	-	-	-
Garden and park waste	-	40	14.0	56.7	3.4	53.8
Nappies	-	40	4.0	44.2	4.5	52.3
Rubber and leather	0.9	84	0.5	88.7	0.3	90.5
Plastic	7.2	100	10.5	-	18.8	-
Metal	3.3	100	0.3	-	0.4	-
Glass	4.0	100	1.5	-	1.1	-
Others	16.3	90	6.6	-	0.4	-

Table 5: List of data sources

Participant observation: site and duration
Ministry of Environment and Forestry (KLHK), formerly Ministry of Environment (KLH), in Jakarta from May 2013 to February 2017
Interviewed organizations (number of interviewed personnel)
Government
KLHK, Jakarta (2)
South Sumatra Provincial Environment Agency, Palembang (3)
Universities
Institut Pertanian Bogor (IPB), Bogor (1)
Institut Teknologi Bandung (ITB), Bandung (3)
Sriwijaya University, Palembang (1)
Donor agencies
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Jakarta (1)
United Nations Development Programme (UNDP), Jakarta (3)
Reviewed documents
Indonesia's legal and policy documents, including its submissions to the UNFCCC
Indonesia: The first national communication on climate change convention (KLH 1999)
National action plan addressing climate change (KLH 2007)
Presidential Regulation of the Republic of Indonesia No. 46/2008 on National Council for Climate Change (President of Indonesia 2008)
Indonesian climate change sectoral roadmap (BAPPENAS 2009)
Intervention by H.E. Dr. Susilo Bambang Yudhoyono President of the Republic of Indonesia on climate change at the G20 Leaders Summit 25 September 2009 (Yudhoyono 2009)
Presidential Regulation of the Republic of Indonesia No. 61/2011 on national action plan on GHG emission reduction (President of Indonesia 2011a)
Presidential Regulation of the Republic of Indonesia No. 71/2011 on national GHG inventory system (President of Indonesia 2011b)
Indonesia second national communication under the United Nations Framework Convention on Climate Change (KLH 2011)
Presidential Regulation of the Republic of Indonesia No. 62/2013 on managing agency for the reduction of emissions from deforestation and forest degradation and peatlands (President of Indonesia 2013)
Presidential Regulation of the Republic of Indonesia No. 165/2014 on arrangement of duties and functions of the cabinet (President of Indonesia 2014)

Presidential Regulation of the Republic of Indonesia No. 16/2015 on the Ministry of Environment and Forestry (President of Indonesia 2015)
Ministerial Regulation No. P.18/MENLHK-II/2015 on organization and functions of the Ministry of Environment and Forestry (KLHK 2015)
First nationally determined contribution, Republic of Indonesia (KLHK 2016a)
Indonesia first biennial update report under the United Nations Framework Convention on Climate Change (KLHK 2016b)
Ministerial Regulation No. P.73/MENLHK/SETJEN/KUM.1/12/2017 on national GHG inventory implementation and reporting guidelines (KLHK 2017)
Indonesia third national communication under the United Nations Framework Convention on Climate Change (KLHK 2018a)
Indonesia second biennial update report under the United Nations Framework Convention on Climate Change (KLHK 2018b)
Documents by donor agencies
Joint evaluation: Indonesia Climate Change Programme Loan (AFD and JICA 2014)
Final report on the Project of Capacity Development for Climate Change Strategies in Indonesia (JICA 2015a)
Capacity Development for Developing National GHG Inventories (Sub-Project 3. of Project of Capacity Development for Climate Change Strategies in Indonesia: Project activity completion report (JICA 2015b)

Source: Authors.

Table 6: Evolving interpretations of the national GHG inventory issue in Indonesia (the crucial trigger-events are indicated with an asterisk; notable interpretations are shown in italics. (produced in reference to Kawanishi et al. 2020a)

Phase	Parking Phase (March 1994–September 2009)	Run-Up Phase (September 2009–October 2014)	Take-Off Phase (October 2014–July 2021)
Key Events			
International	1994 UNFCCC entered into force.	2010 Cancun Agreements at COP16. 2011 Durban Outcome at COP17.	(*. 2015 Paris Agreement at COP21.
National	2008 DNPI was established, taking over the role of the national focal point from KLH.	(*. 2009 Then President Yudhoyono announced the country's commitment to GHG emission reductions. 2011 Presidential Regulations No. 61/2011 on RAN-GRK and No. 71/2011 on national GHG inventory.	(*. 2014 President Widodo announced a merger of two ministries to form KLHK. He established the Directorate General of Climate Change at KLHK, and dissolved DNPI and the REDD+ Agency, transferring their functions to KLHK.
Other Developments			
JICA Project			
Issue Urgency			
Issue Importance	Reporting as a commitment under the UNFCCC. *Isolated issue: no quantitative target for GHG emission reductions in Indonesia yet.*	*National GHG inventory as a foundation for tracking progress of RAN-GRK.* With the JICA technical cooperation, the issue came to be defined by KLH as the problem that must be solved.	*National GHG inventory as a foundation for tracking progress of NDCs.*
Issue Immediacy &	The first NC shall be	RAN-GRK was officialized in 2011, effective	The Paris Agreement has been implemented,

Duration	submitted within three years of the entry-into-force of the UNFCCC or of fund availability.	towards 2020.	starting in 2020. It is durable for the century.
Issue Responsibility	The national focal point of the UNFCCC was transferred from KLH to DNPI.	KLH was a lead agency for the national GHG inventory. However, DNPI, BAPPENAS, and the REDD+ Agency were most influential on the climate change policy at this stage.	*KLHK has consolidated responsibilities*: It is the national focal point of the UNFCCC and a lead agency for both NDC and national GHG inventory.
Issue Feasibility	A limited number of national experts capable for inventory calculations.	KLH was provided by the technical cooperation with means for addressing the issue.	GHG inventory calculations have become completed inhouse within the SIGN Center.
Issue Interdependence	Isolated issue: no quantitative target for GHG emission reductions in Indonesia yet.	*Interdependence between national GHG inventory and RAN-GRK.*	*Interdependence between national GHG inventory and NDC*: KLHK is an overall lead agency for both issues.
Organizational Actions by KLHK (or KLH)	Developed the National Action Plan Addressing Climate Change in 2007, scarcely mentioning the issue of national GHG inventory.	Established SIGN Center at KLH. Strengthened staff training through the technical cooperation.	Established the Directorate of GHG Inventory and MRV at KLHK. The methodological improvements under the JICA technical cooperation were replicated in wider locations. Applied key performance indicators for appraising the SIGN Center staff. Upgraded the reporting system.

Table 7: Effects of the JICA technical cooperation on the interpretations at KLHK and their actions on the national GHG inventory issue (produced in reference to KLHK 2016b, p 2-74; KLHK 2018a, p 49)

	Effects of the Project on the issue interpretations	→	Subsequent Actions by KLHK
Issue urgency	A significant level of uncertainty in the country's GHG inventories has been demonstrated. The issue came to be defined by KLHK as the problem that must be addressed.		KLHK initiated the following actions for quality improvements of GHG inventories in the waste sector: - Produced its own guidance document based on the manual developed under the technical cooperation. - Used the above guidance for strengthening staff training and replicating methodological improvements in other provinces, such as DKI Jakarta, East Java, and Riau. - Utilized waste generation data reported by local governments, so-called ADIPURA data, instead of relying on the relevant IPCC default value. - Refined waste stream data through literature review. - Continued to apply the specific parameters for bulk density, waste composition, and dry matter content in the subsequent rounds of national GHG inventory preparation. - Upgraded the reporting software and completed so-called SIGN-SMART, a web-based reporting system, which is now effective in actual use. - Kept the endogenous experts involved as sources of knowledge and experiences.
Issue feasibility	Perceived feasibility has been enhanced through the following activities of the Project: - Methodologies for the improvements of GHG inventories in the waste sector have been demonstrated and compiled in a manual. - Waste stream surveys have been demonstrated. - Specific parameters in bulk density, waste composition, and dry matter content have been developed. - Software for local governments to report data and information has been designed. - Related staff at the national and local levels have gained knowledge and experiences through on-the-job training. - Endogenous experts have been involved.		
Issue interdependence	The significant spill-over effect of the issue to the country's climate change mitigation policy has been demonstrated. The necessity for quality improvements in GHG inventories has been recognized.		

Abstract (in Japanese)

要約

本研究は技術協力が途上国における内生的かつ長期的なキャパシティ・ディベロップメントに及ぼす効果の道筋と条件を明らかにするために、インドネシアにおける国家温室効果ガス（GHG）インベントリの事例を分析した。同国では、かつて GHG インベントリの算定業務を外部専門家に委託していたが、現在では環境林業省（KLHK）の内部人材により、その業務を完結している。同国の長期的なキャパシティ・ディベロップメントの過程を辿り、これに対し（独）国際協力機構（JICA）による 5 年間の技術協力がどのように触媒効果を生んだのかを考察した。分析枠組みとして戦略的課題診断モデル（model of strategic issue diagnosis）を活用することにより、KLHK において、国家 GHG インベントリ作成という課題がどのように解釈されてきたか、また解釈の変化に応じてどのような行動がとられてきたのかについて、時系列の追跡を行った。これに基づき、技術協力が制度・社会面の変化との相乗作用を通じ、課題の緊急性・実施可能性・相互関係性に関する KLHK における解釈のあり方に変革を起こし、それをきっかけとして現状克服に向けた内発的な力を生んだ過程が明らかになった。技術協力を通じてそれまでの GHG インベントリ報告に大きな不確実性があることが明らかになったことで、KLHK 自身がインベントリ作成を単なる作業で終わるものではなく、解決すべき重要な問題として認識することができるようになった経緯を示すことができた。本研究は、インドネシア政府が直面した固有の状況を理解することが、技術協力の触媒効果、あるいはその欠如を評価する上で重要であることを示した。固有の状況は、長期にわたる時間軸、及び直接的な受益者を超えた広範な空間軸の中で理解し得るものであり、そうした理解をベースに技術協力の評価を行うことが重要である。

キーワード： キャパシティ・ディベロップメント、気候変動、課題解釈、カーボン・エミッション、インドネシア